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Screen Time and Physical Activity in Overweight and Obese Students

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Abstract

Background: One of the most important threats for children's health status is being overweight and obesity, and related causes such as screen time prevalence. Prevalence of being overweight and obesity in children is associated with health risk consequences in adulthood.
Objectives: The purpose of this study was to assess the prevalence of screen time and physical activity in overweight and obese students.
Patients and Methods: In this cross sectional descriptive study we randomly selected 302 students, from all districts of Qazvin, who's relative body mass index (RBMIs) were above the 85th percentile. Their screen time and physical activity prevalence were assessed with two separate techniques (self-report and parent-report). Pearson correlation test and regression analysis were done to examine the association between RBMI, screen time and physical activity.
Results: Mean screen time in boys was more than girls, in both overweight screen time- self report technique (ST-SRT: 1.93 ± 0.24 vs. 1.26 ± 0.44, ST-PRT: 3.4 ± 0.22 vs. 2.1 ± 0.15) and obese subjects (ST-SRT: 1.88 ± 0.31 vs. 1.37 ± 0.49, ST-PRT: 3.2 ± 0.32 vs. 2.3 ± 0.34) yet overweight subjects had less total screen time than obese individuals ($P < 0.05$). Pearson correlations with one-tailed test indicated that screen time had a significant association with RBMI. In addition, there was a significant association between the two techniques of screen time and physical activity measurements. The model of regression for screen time and RBMI was significant ($F = 45$, $P = 0.000$, $R^2 = 0.42$) and screen time explained about 16% of variance in RBMI ($B = 0.021$, $SEB = 0.004$, $\beta = 0.325$).
Conclusions: Our research determined an association between screen time, physical activity and RBMI. Screen time was a prominent predictor of RBMI in children. It is important for health workers to decrease screen time of children to prevent the prevalence of being overweight and obesity.

Keywords: Physical Activity, Sedentary Behavior, Overweight, Obesity

1. Background

One of the most important threats for children's health status is obesity and being overweight (1-3). It affects approximately 10 percent of children worldwide and seems to be more common in developing countries, and there are some influential variables, such as daily activities, diet, psychosocial factors, ethnicity, parental views, gender, socioeconomic status and genetics (4-10). As the prevalence of being overweight and obesity in children is associated with health risk consequences in adulthood, most health interventions have aimed to manage children's weight via change in their diet habits, daily activity and scheduling screen time (11-14).

Screen time, which is considered as a sedentary behavior, and is defined as the time spent watching TV, playing computer games and Internet use, has been associated with a high prevalence of being overweight and obese, and their related consequences such as type 2 diabetes and cardiovascular diseases (12, 13). Research has shown that the amount of time young people spend on sedentary behaviors has increased in the recent years, and while this includes time spent watching TV, there has been a dramatic increase in other types of screen time, such as computers and video games, that appear to be driving the trend. There has also been an increase in the percentage of children who spend an excessive amount of time (two or more hours per day) on sedentary behaviors. A number of studies have linked watching TV with increased risk of being overweight and obese among children and teens (15, 16).

Many researches have revealed a complex relationship between screen time and physical activity, and that in children, the more daily screen time is associated with less physical activity. Less physical activity is accompanied by consequences such as more screen time. Decreasing the prevalence and incidence of high-risk behaviors in children is a priority for health workers, because it is an effective strategy for lifetime disease prevention (11, 14, 17-21). Many health agencies and foundations have recommended national or international strategies for children's daily screen time and physical activity (18, 22, 23). Despite the existence of some differences in their recommendations, they all agree that daily screen time

should be limited while daily physical activity should be enhanced. Based on these recommendations, health workers encourage parents to establish some rules to diminish children's sedentary behaviors such as watching TV, browsing on the internet and video games, yet the results of studies are disappointing (14, 24).

2. Objectives

The purpose of this study was to assess the prevalence of screen time and physical activity in overweight and obese students. Although the key behavior influencing children obesity is dietary pattern, only children's screen time and physical activity have been assessed in this study.

3. Patients and Methods

3.1. Sampling

This cross-sectional descriptive study was done to explore the screen time and physical activity prevalence in overweight and obese students. This research was approved by the Qazvin educating and training organization (QETO).

Using the following sample size formula (Equation 1), 302 elementary students (142 boys and 160 girls) of the 5th and 6th grade, whose RBMIs were above the 85th percentile and had no restrictions for physical activity, were randomly selected from all districts of QETO. Written informed consent was obtained from all subjects and their parents/guardians prior to their participation in the study.

(1) $$\mathrm{SNN} = Z^2 \frac{pq}{d^2}$$

3.2. Data Gathering Techniques

By trained research staff, we applied two techniques for screen time and physical activity measurement, including the screen time self-report and parent-report techniques (ST-SRT/ST-PRT) and physical activity self-report and parent-report techniques (PA-SRT/PA-PRT). Self-report measurement techniques for screen time (ST-SRT) and physical activity (PA-SRT) were applied in school environments for students. In contrary, related parent report methods (ST-PAR and PA-PRT) were applied via a home visit when the children were at school. Questions of ST-SRT and ST-PRT are shown in Table 1. In PA-SRT we used the modified previous day physical activity recall (PDPAR). The PDPAR is a self-report checklist with 32 common activities and games for children (21). Some of these activities were uncommon for our research community, such as dancing. Thus we substituted these with local common activities, such as Ley Ley. For PA-PRT, we asked mothers to estimate the students' weekly moderate (MPA) and vigorous (VPA) physical activities and walking time in hours and minutes (Table 2). Qualitative content and face validity of these questionnaires were assessed with a panel of health promotion experts. Three trained research staff, educated subjects about these questions and made some examples for MPAs, VPAs and walking prior and during the questionnaire fulfillment.

Table 1. Self-Report and Parent-Report Techniques Questionnaire

Techniques in a Typical Week	Answers
ST-SRT	
During weekdays, how many days do you spend for TV, computer games, Internet browsing, etc.?	. . . day/days
During weekdays, how many hours and minutes per day do you spend for TV, computer games, Internet browsing, etc.?	. . . hours and . . . minutes
During two weekends, how many days do you spend for TV, computer games, Internet browsing, etc.?	. . . day/days
During weekdays, how many hours and minutes per day do you spend for TV, computer games, Internet browsing, etc.?	. . . hours and . . . minutes
ST-PRT	
During weekdays, how many days does your child spend for TV, computer games, Internet browsing,etc.?	. . . day/days
During weekdays, how many hours and minutes per day does your child spend for TV, computer games, Internet browsing, etc. daily?	. . . hours and . . . minutes
During two weekends, how many daysdoes your child spend for TV, computer games, Internet browsing, etc.?	. . . day/days
During two weekends, how many hours and minutes per day does your child spend for TV, computer games, Internet browsing and etc. daily?	. . . hours and . . . minutes

Table 2. Physical Activity Parent-Report Questionnaire

In a Typical Week	Answers
During weekdays, how many days does your child do Moderate Physical Activities (MPA)?	. . . day/days
During weekdays, how many hours and minutes does your child do Moderate Physical Activities (MPA) daily?	. . . hours and . . . minutes
During two weekends, how many days does your child do Moderate Physical Activities (MPA)?	. . . day/days
During two weekends, how many hours and minutes does your child do Moderate Physical Activities (MPA) daily?	. . . hours and . . . minutes
During weekdays, how many days does your child do Vigorous Physical Activities (VPA)?	. . . day/days
During weekdays, how many hours and minutes does your child do Vigorous Physical Activities (VPA) daily?	. . . hours and . . . minutes
During two weekends, how many days does your child do Vigorous Physical Activities (VPA)?	. . . day/days
During two weekends, how many hours and minutes does your child do Vigorous Physical Activities (VPA) daily?	. . . hours and . . . minutes
During weekdays, how many days does your child do walking?	. . . day/days
During weekdays, how many hours and minutes does your child do walking daily?	. . . hours and . . . minutes
During two weekends, how many days does your child do walking?	. . . day/days
During two weekends, how many hours and minutes does your child do walkingdaily?	. . . hours and . . . minutes

3.3 Analysis

All of the gathered data were entered, coded and then analyzed with the SPSS 17 software. Initially, descriptive statistical method was used for subjects' demographic data analysis. Mean and standard deviation for ST-SRT and ST-PRT was calculated for five school days, two weekends and in a total week, separately. Calculation of PDPAR was done based on the Trial Activity for Adolescent Girls TAAG protocol and mean energy consumption (MET) was calculated Based on International physical activity questionnaire IPAQ scoring (25). We calculated weekly MET using the following formula and by dividing the sum by seven, daily MET was calculated.

$$(2)\quad (\text{Walking time} \times 3.3) + (\text{MPA} \times 4) + (\text{VPA} \times 8)$$

To assess the gender and RBMI differences for screen time, and energy consumption for physical activity, independent t-test was performed. To examine relationships between RBMI, screen time and physical activity, bivariate correlation analyses were used by Pearson's correlation coefficient. Finally, screen time, physical activity and RBMI were entered into the linear regression analysis to examine regression.

4. Results

4.1. Demographic and Descriptive Analysis

In total, 49% of the subjects (n = 148) were overweight (33 boys and 115 girls) and 51% were obese (n = 154, 109 boys and 45 girls). The average of the subjects' age was 11.2 ± 0.6 years and 52% (n = 157) were at the 5th grade.

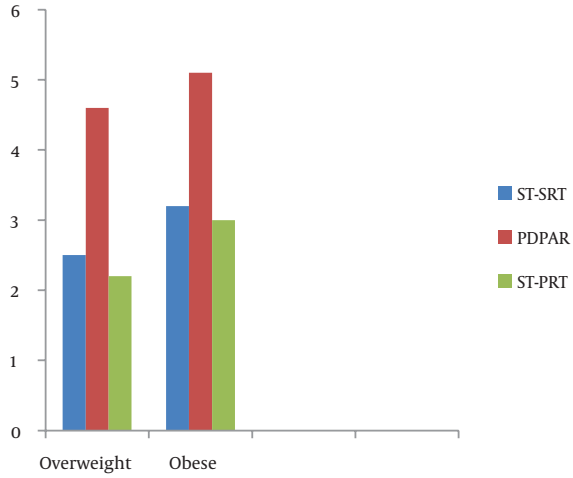

Figure 1. Mean Screen Time Self-Report (ST-SRT), Previous Day Physical Activity Recall (PDPAR) and Screen Time Parent-Report (ST-PRT)

Mean screen time (ST-SRT and ST-PRT) was higher in boys than girls, in both overweight and obese subjects but overweight subjects had less total screen time than obese individuals (ST-SRT; 2.5 ± 0.68 versus 3.2 ± 0.9 and ST-PRT; 2.2 ± 0.48 versus 3.0 ± 0.35) ($P < 0.05$). In addition, physical activity had a higher prevalence in boys than girls, and obese subjects had more physical activity than overweigh with significant mean differences ($P < 0.05$) with the exception of VPA ($P \geq 0.05$) (Table 3 and Figure 1).

Table 3. Prevalence (mean ± SD) of Screen Time Self-Report (ST-SRT) and Parent-Report (ST-PRT), Previous Day Physical Activity Recall (PDPAR), Vigorous Physical Activity (VPA), Moderate Physical Activity (MPA), Walking and Physical Activity Parent-Report (PA-PRT)

	Overweight	Obese	P Value
ST-SRT, h/d			
Girls	1.26 ± 0.44	1.37 ± 0.49	
Boys	1.93 ± 0.24	1.88 ± 0.31	
Total	2.5 ± 0.68	3.2 ± 0.9	0.000[a]
P value	0.000[a]	0.000[a]	
ST-PRT, h/d			
Girls	2.1 ± 0.15	2.3 ± 0.34	
Boys	3.4 ± 0.22	3.2 ± 0.32	
Total	2.2 ± 0.48	3.0 ± 0.35	0.000[a]
P value	0.000[a]	0.000[a]	
MPA, h/w			
Girls	2.1 ± 1.3	2.51 ± 1.3	
Boys	3.4 ± 0.7	3.54 ± 0.69	
Total	2.4 ± 1.35	3.2 ± 1.00	0.000[a]
P value	0.000[a]	0.000[a]	
VPA, h/w			
Girls	2.6 ± 1.6	2.1 ± 1.1	
Boys	3.6 ± 0.7	3.5 ± 0.8	
Total	2.8 ± 1.5	3.1 ± 1.2	0.068[b]
P value	0.000[a]	0.000[a]	
Walking, h/w			
Girls	0.5 ± 0.1	0.5 ± 0.01	
Boys	0.56 ± 0.2	0.52 ± 0.4	
Total	0.58 ± 0.1	0.61 ± 0.12	0.000[a]
P value	0.000[a]	0.000[a]	
PDPAR, MET [c]			
Girls	4.3 ± 1.7	4.1 ± 0.9	
Boys	5.6 ± 0.69	5.5±0.6	
Total	4.6 ± 1.1	5.1±0.9	0.000[a]
P value	0.000[a]	0.000[a]	
PA-PRT, MET			
Girls	4.1 ± 1.2	3.8 ± 1.4	
Boys	6.1 ± 0.9	6.0 ± 1.01	
Total	4.6 ± 1.8	5.4 ± 1.5	0.000[a]
P value	0.000[a]	0.000[a]	

[a]Differences are significant with 95% confidence interval.
[b]Differences are not significant with 95% confidence interval.
[c]Metabolic equivalent task per day.

4.2. Bivariate Correlation and Regression Analysis

Pearson's correlation with one-tailed test of significance indicated that ST-SRT (r = 0.36, P = 0.000) and ST-PRT (r = 0.32, P = 0.000) had significant associations with RBMI. In addition, there was a significant association between PDPAR and PA-PRT (r = 0.89, P = 0.000) and thus, between ST-SRT and ST-PRT(r = 0.74, P = 0.000). The RBMI was regressed on ST-SRT (r = 0.36, P = 0.000). The model was significant (F = 45, P = 0.000, R^2 = 0.42) and ST-SRT explained about 16% of the variance in RBMI (B = 0.021, SEB = 0.004, β = 0.325).

5. Discussion

This study assessed the prevalence of screen time and physical activity among overweight and obese students. Our findings indicated that obese subjects had not only more daily MET but also more daily screen time than overweight individuals, and there were gender-based differences, as well; boys had the highest daily MET and screen time. Subjects who had more RBMI had more screen time and daily MET, as well. At first glance, the results seem contradictory; because increased RBMI and screen time, results in low daily MET consumption. Similar studies discovered that low physical activities, such as screen time, resulted in increased RBMI (13, 26-28). Body composition changes with physical activity. Physicians and health workers have claimed that their obese and overweight clients perform more physical activity (4, 6, 29). In our research the contradictory results may be due to application of the self-report tool (PDPAR) for physical activity assessment. All of the self-report tools have a common disadvantage, which is probability response bias (4, 30). This refers to the subjects' tendency to respond a certain way, regardless of the actual evidence. Some researches have revealed that obese subjects may exaggerate about their daily physical activity (4).

Our research also revealed a gender difference for physical activity and screen time; boys spent more time onscreen viewing and had a greater MET consumption. This may be due to gender disparities (14, 31, 32). Parental or community rules may restrict girls screen time and duration spent on computer games compared to boys. It is noteworthy that many guidelines recommend lower daily physical activity for girls. Based on the findings of our research, there was a significant association between screen time and RBMI, in both measuring techniques. Subjects who spent more time on physical in-activities or sedentary behaviors had the tendency to become obese. One of the most common causes of children's weight gain is the amount of daily MET consumption; the more sedentary behaviors, the greater the RBMI (12, 20, 33-35). On the other hand, this research discovered an association between the two techniques of physical activity (PA-SRT and PA-PRT) and screen time (ST-SRT and ST-PRT) measurements. Therefore, the application of parent-report techniques for physical activity and screen time measurements in children is recommended.

Finally, this study revealed that screen time explains 32% of the variance in subjects' RBMI. This finding is consis-

tent with the results of the childhood and adolescence surveillance and prevent ion of adult non-communicable disease CASPIAN study (36) and is supported by the findings of previous researches (11, 12, 14, 28, 37).

In conclusion, based on these findings, sedentary behaviors such as screen time, are powerful predictors of children's RBMI, thus health workers are recommended to conduct interventions targeting children's sedentary behaviors, especially screen time scheduling.

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Footnotes

Authors' Contribution: Kazem Hosseinzadeh: study design and data collection. Mostafa Shokati: data analysis and academic writing.

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